Investing in Innovation: What Pays?

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An Economist's Prophecies

"It's déjà vu All Over Again!"

"I Really Didn't Say Everything I Said"

"When You Come to A Fork in The Road – Take It!"

"The Future Ain't What it Used to Be!"

Yogi Berra

Clark is Optimistic about the Pear Industry!

ARE YOU? AND IF SO, WHY?

Clark is Optimistic about the Pear Industry!

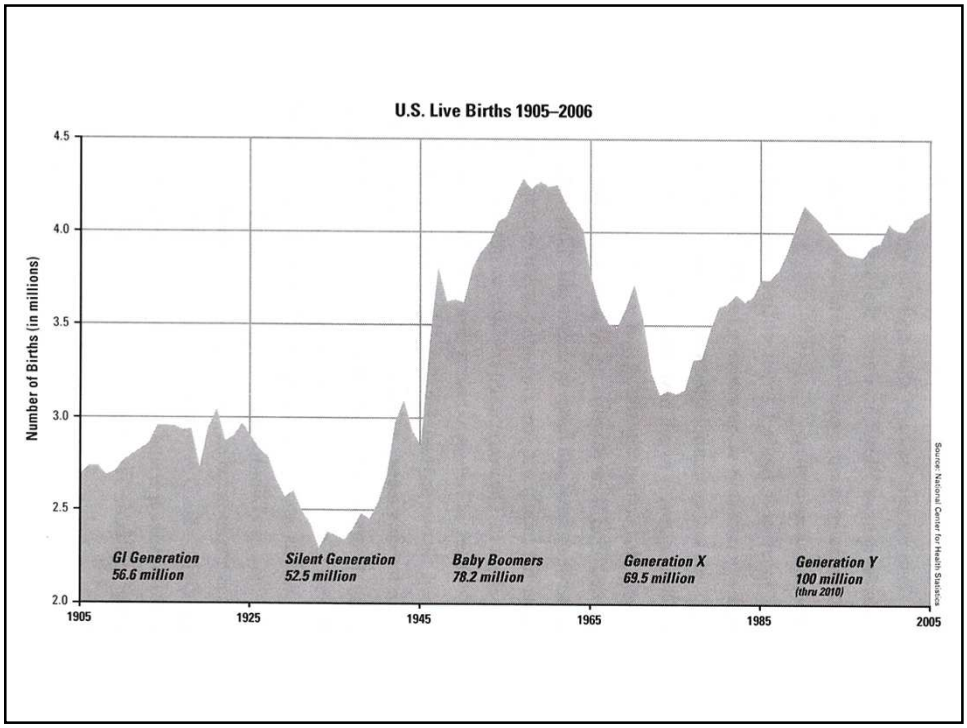
1. **Outside of the pear industry, nobody is talking about pears!**
   - **Other crops that are more exciting**
     Hazelnuts, Blueberries, Apples, Cherries
   - **Time to reach full production (ROI)**
   - **New Varieties?**
   - **Rootstocks?**
2. **Grown mainly in the western U.S.**
3. **Acreage is fairly steady**

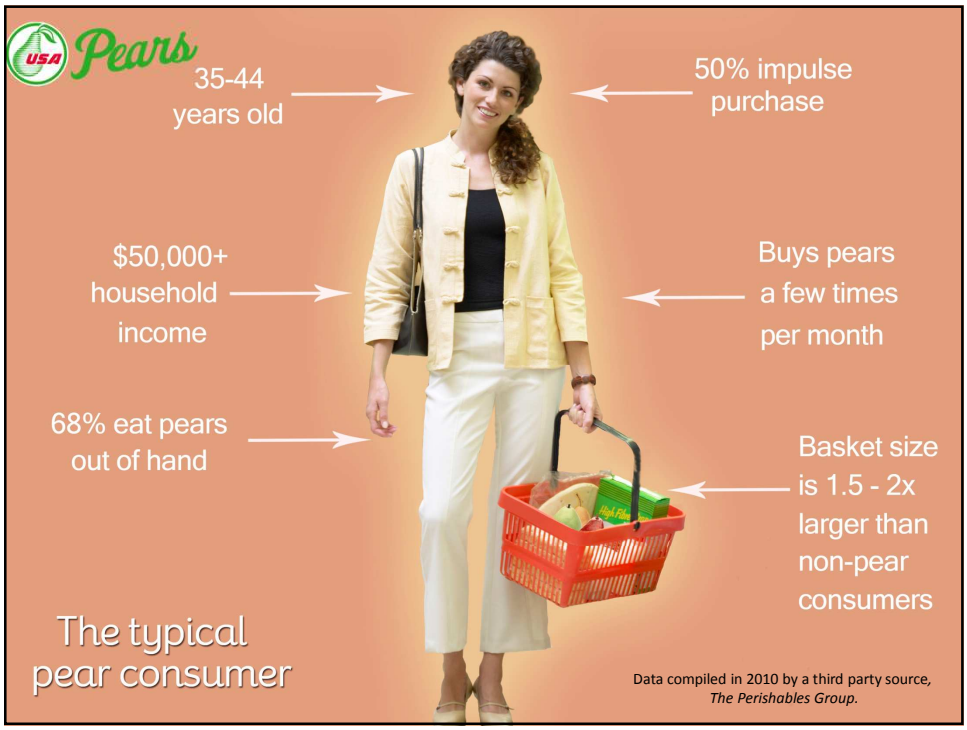
Clark is Optimistic about the Pear Industry!

4. Supply of pears are steady, worldwide
   Europe supply is flat if not declining
   China growing Asian Pears, European pear?
5. Middle class households are growing, worldwide

Challenges for the Pear Industry!

1. Food safety
2. Regulations
3. Trade issues
   - Russia
4. Value of the dollar
   - Canada & Mexico (biggest importers of your pears)
5. Consumption (steady)


U.S. Live Births 1905–2006
Number of Births (in millions)
4.5
4.0
3.5
3.0
2.5
2.0
1905
1925
1945
1965
1985
2005
GI Generation
56.6 million
Silent Generation
52.5 million
Baby Boomers
78.2 million
Generation X
69.5 million
Generation Y
100 million
(thru 2010)
Source: National Center for Health Statistics


USA Pears
35-44 years old
50% impulse purchase
$50,000+ household income
Buys pears a few times per month
68% eat pears out of hand
Basket size is 1.5 - 2x larger than non-pear consumers
The typical pear consumer
Data compiled in 2010 by a third party source, The Perishables Group.

Top Fruit

1. Apples
2. Bananas
3. Grapes
4. Strawberries
5. Oranges
6. Avocados
7. Blueberries
8. Cherries
9. Watermelon
10. Peaches
11. Pears

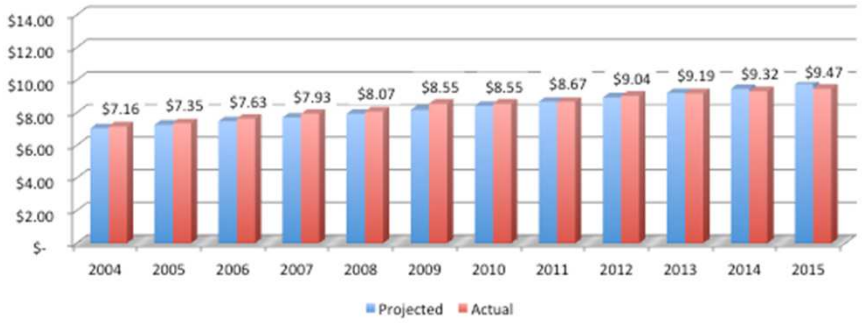
Neilson Perishables Group FreshFacts

Challenges for the Pear Industry!

6.Consumer's want to know about their food
7.Labor – Supply and Cost

Mechanical Harvesting in Precision Horticulture

Minimum Wage Rates – Projected and Actual – for Washington State, 2004 to 2015



Mechanical Harvesting in Precision Horticulture

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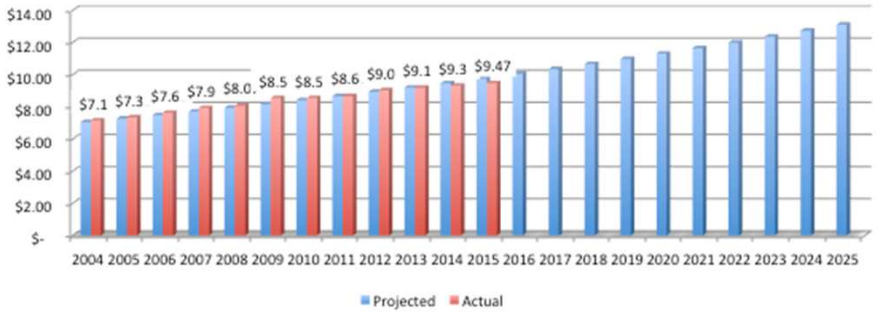


Research is Advancing Fruit Quality and Quantity!

Controlling vigor and increasing fruit set
- **chemical**
- **root pruning**
- **Retain**

New varieties (fireblight resistence?)

Promising rootstocks but perhaps longer-term goal

What can UAS technology do for your business?

Count fruit – precision thinning

increase % of larger fruit
increase % of higher quality fruit
minimize alternate bearing

– yield estimation

increase harvest efficiencies
profit from better marketing strategies
reduce cold storage issues

Canopy management –year to year consistency in yields

Fertility management – precision application of N_2

Water management – water is the current conflict between agriculture and non-agricultural populations

How much does it cost?

Cost Minimizer

How much does it cost?

Cost Minimizer

What benefits can I expect to receive?

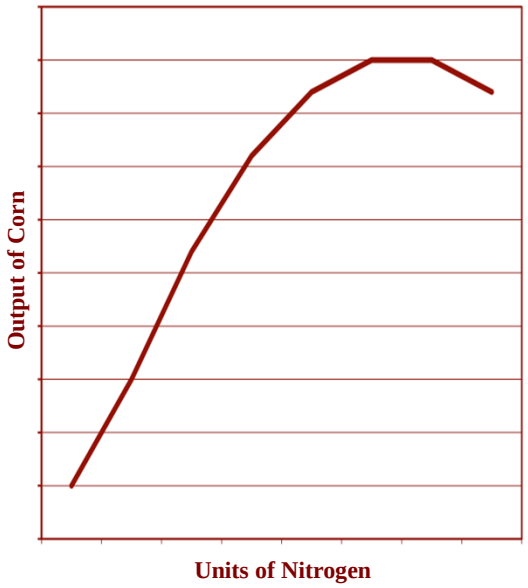
Profit Maximizer

The Profit Maximization Concept:

Suggests that You Will Invest Money on Inputs to Increase Revenues as Long as the Incremental Revenues are Over and Above the Incremental Costs!

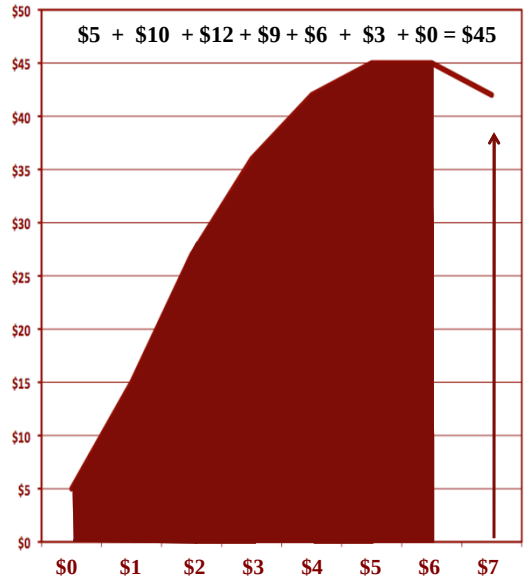
Cost Minimization vs. Profit Maximization

Law of Diminishing Returns



Cost Minimization vs. Profit Maximization

Production Function



Capital Investment Analysis

A budgeting procedure that assesses the potential profitability of a long-term investment.

Financial Concepts used to Evaluate Investments

- **Net Present Values (NPV)**
- **Internal Rate of Return (IRR)**
- **Break-even Year to Cash Flow**

Key Factors in Mechanization of Pear Harvest

- **Return to the Grower**
- **Cost of Mechanized Machine**
- **Single Pick (bins harvested per hour)**
- **Mix of Varieties over Harvest Season**
- **Training System (field efficiency)**
- **Total Harvested Acres per Machine**

Key Factor in Any Equipment Investment Analysis

Field Capacity (Efficiency)

Field efficiency is defined as the percentage of time the machine operates at its full rated speed and width while in the field.

Turning and idle travel;
Operating at less than full width;
Handling fertilizer, chemicals, water or harvested materials;
Cleaning clogged equipment;
Machine adjustment;
Lubrication and refueling during the day;
Waiting for other machines;
Waiting for repairs to be made.

Field Efficiency In Other Agricultural Field Operations

	Field efficiency	
	Range (%)	Typical (%)
Tillage & planting		
Moldboard plow	70-90	85
Heavy-duty disk	70-90	85
Row crop planter	50-75	65
Grain drill	55-80	70
Harvesting		
Corn picker sheller	60-75	65
Combine	60-75	65
Mower	75-85	80
Mower (rotary)	75-90	80
Miscellaneous		
Fertilizer spreader	60-80	70
Boom-type sprayer	50-80	65

Source: ASAE standards, 2004

Key Factor in Any Equipment Investment Analysis

Acres per Hour

$$\frac{\text{Equipment Speed} \times \text{Width of Operation} \times \text{Field Efficiency}}{8.25}$$

(relationship of rods in a mile and square feet per acre)

Estimated Acres per Hour for Mechanical Harvest Operation

$$\frac{1.0 \text{ mph} \times 12 \text{ feet} \times 30\%}{8.25} = 0.44 \text{ Ac/Hr}$$

Estimated Acres per Hour for Mechanical Harvest Operation

0.44 acres per hour
× 20 hours per day

8.80 acres/day
× 25 days of harvest

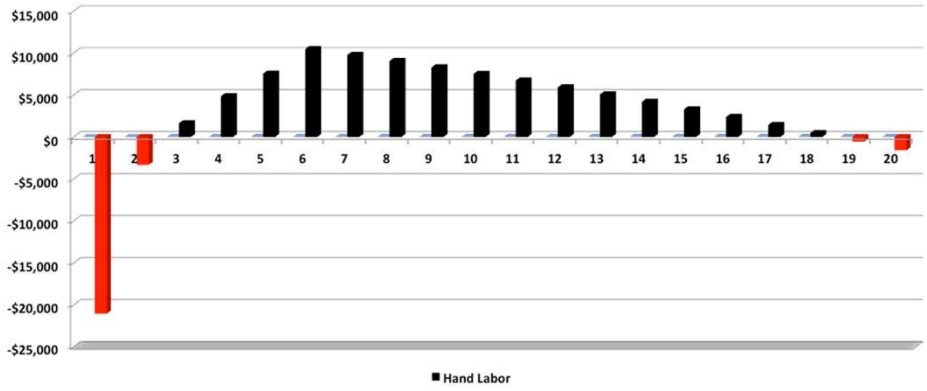
220 total acres per season

Estimated Acres per Hour for Mechanical Harvest Operation

MPH	Field Efficiency	Acres/ Hour	Total Acres
1.0	*30%*	*0.44*	*220*
1.5	30%	0.65	325
1.0	40%	0.58	290
1.5	40%	0.87	435
1.0	50%	0.73	365
1.5	50%	1.09	545
1.0	60%	0.87	435
1.5	60%	1.31	655

Bi-axe planting in Chelan, with 55 Bin per Acre crop in 2013

Establishing a New Pear Orchard, 1,089 TPA, 12' Centers
Begin Prod. in Year 3, Full Prod. w/ 65 BPA in Year 6, $300/Bin



Hand Harvest

Net Present Value **$22,842**
(8% Discount Rate)

Establishing a New Pear Orchard, 1,089 TPA, 12' Centers
Begin Prod. in Year 3, Full Prod. w/ 65 BPA in Year 6, $300/Bin

- $400,000 for a Mechanical Harvester Machine
- Spread Costs over 100 acres for a $4,000 per acre cost
- Life of Machine is 10 Years (obsolesce/depreciated)
- Replace Machine in 10 Years
- Purchase Mechanical Harvester in Year 4 & 14
- Salvage Value of $40,000 in Year 13 & $100,000 in Year 20
- Maintenance & Repairs = 5% of purchase price ($200/acre)
- All costs are inflated at 3% annually

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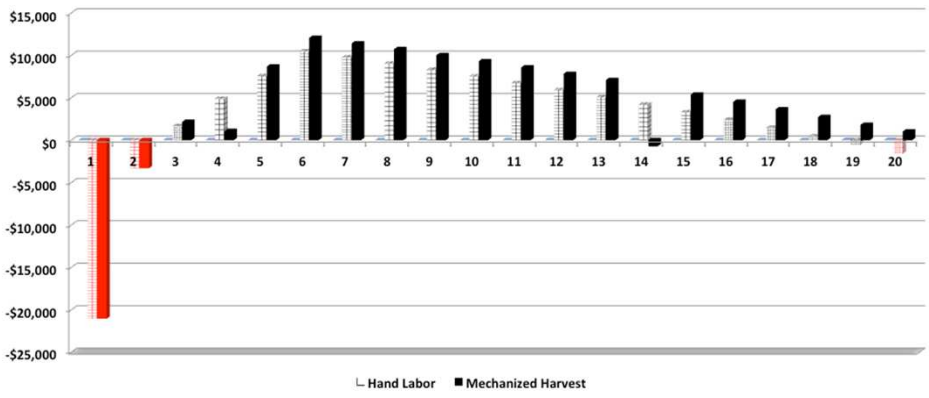

	Hand Harvest	Machine
Net Present Value (8% Discount Rate)	$22,842	$29,935

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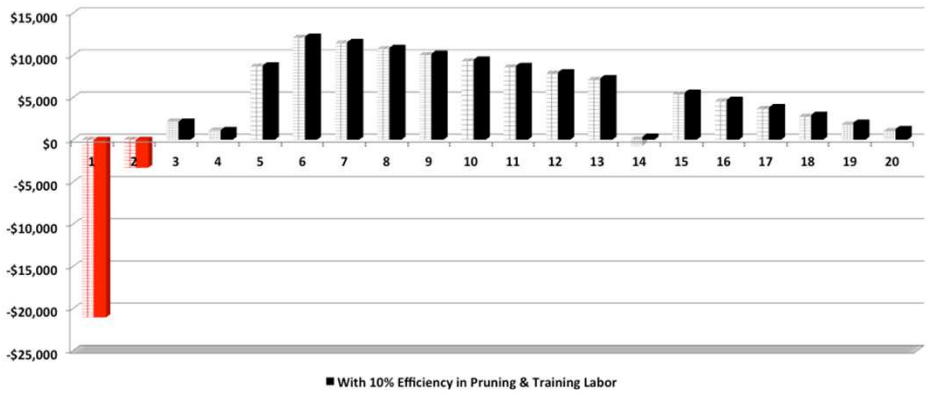
Begin Prod. in Year 3, Full Prod. w/ 65 BPA in Year 6, $300/Bin



	Hand Harvest	Machine	W/P & T
Net Present Value (8% Discount Rate)	$22,842	$29,935	$31,533

Investing in Innovation: What Pays?

Takeaways

- ✓**Technology (i.e. AUV's) will benefit fruit producers more than any other sector in agricultural (high input-high output; market product by size and grade characteristics)**
- ✓**With that said, not all pear blocks will benefit from precision technologies equally, more will benefit than others (yields, varieties, packout, training system)**
- ✓**It is critical to know your production, packout and input costs on a block-by-block basis to allocate resources to those blocks that will generate the most profits**

Investing in Innovation: What Pays?

Takeaways

- ✓ **Returns to the Grower is still #1**
- ✓ **Do not focus on the cost of mechanized machine!**
- ✓ **Focus on bins harvested per hour**
- ✓ **Mix of varieties over harvest season, key to maximizing the capacity of the machine**
- ✓ **The training system is key to field efficiency, which impacts the total harvested acres per machine**